

TEXT-BOOK
OF
ANATOMY AND PHYSIOLOGY

FOR TRAINING SCHOOLS AND OTHER
EDUCATIONAL INSTITUTIONS

BY
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PREFACE TO THE FOURTH EDITION

The fourth edition of this book, like the two preceding ones, has been prepared with the hope that by certain changes and additions, it will meet the still increasing demand for a text-book which shall present the subject of Physiology as well as Anatomy, in a manner both practical and available to the student.

To include these two large subjects under one cover, with the necessary brevity and still with sufficient clearness, is a task with difficulties of its own, but it is undertaken with the earnest endeavor to meet the demand created by present requirements as well as may be with the inevitable problem of selection or omission, which, however carefully considered, must remain a matter of judgment and experience.

The plan has been adopted in the descriptions—to emphasize those characteristics which are most essential and which may be most readily grasped and, by reason of practical application, remembered.

The original purpose of the author to provide a special text-book of Anatomy—still remains in effect, since only by means of a knowledge of structure and form can an understanding of use or function be reached.

The student is referred to the Glossary for the meaning of unfamiliar terms, and to the lines of smaller type for various particulars which may be found useful as experience indicates the need for reference.

The original illustrations drawn for this book are all retained and several new ones from other sources are added.

Again the author desires to express appreciation of suggestions and kind words from officials of schools where the book is in use.

PHILADELPHIA

ELIZABETH R. BUNDY.

PREFACE AND DEDICATION TO FIRST EDITION

The pupil-nurse in a training-school has very few hours at command for the study of text-books, but it is hoped that she may find in this "Anatomy for Nurses" an aid to the acquirement of that knowledge of the human body which is essential to the full understanding of her important duties.

In preparing a book of this kind, the inevitable difficulty of selection, when dealing with a subject of such magnitude, is at once manifest. What appears from one point of view to be of minor interest, is from another paramount in importance; while in truth, no detail is of itself insignificant.

The author trusts that in the present work such matters as are not available for immediate use in the hospital ward may still be of value, to meet the growing need of the graduate-nurse as she finds herself developing with the practice of her profession. It was, in part, to meet this frequently expressed need that the work was undertaken.

* * * * *

Concerning the use of anatomic terms, indications point to the general adoption of the nomenclature accepted by the German Anatomical Society at the meeting of 1895, in Basle, Switzerland. The B. N. A., as it is called, will soon be in use among the younger physicians at least; therefore, many of the terms belonging to it are here introduced, and several tables are given which include names not found in the text.

The author gratefully acknowledges her indebtedness to Dr. Marie L. Bauer for valuable aid in the preparation of the book, and to Drs. Frances C. Van Gasken and J. William McConnell for assistance in the reading of proofs and for helpful suggestions.

The original illustrations, most of which are printed in colors, are drawn by Chas. F. Bauer.

To the members of the nursing profession, with cherished recollections of labors and responsibilities shared, this Text-book of Anatomy is dedicated.

ELIZABETH R. BUNDY.

CONTENTS

INTRODUCTORY

	PAGE
Plan of study; anatomic terms; muscle, nerve, and connective tissues; epithelial tissues; gland structure; serous and mucous membranes; processes included in <i>metabolism</i> of the body; chemical elements and symbols.	I

CHAPTER I

BONE TISSUE AND BONE CLASSIFICATION. ARTICULATIONS

Chemical composition of bone; structure of osseous tissue; marrow; medullary and nutrient canals; shapes and surfaces; periosteum; ossification; divisions of the skeleton; joint movements; <i>remarks</i>	II
---	----

CHAPTER II

BONES AND ARTICULATIONS OF THE SKULL

Bones of the cranium; sutures and fontanelles; bones of the face; the mandibular joint; the skull as a whole; four larger fossæ of the skull; the teeth; dentition; care of the teeth; <i>clinical and obstetric notes</i>	20
--	----

CHAPTER III

BONES AND ARTICULATIONS OF THE SPINAL COLUMN AND TRUNK

The vertebrae; <i>ligamenta flava</i> ; <i>ligamentum nuchæ</i> ; movements of spinal column; spinal curves; bones and articulations of the thorax; the pelvic girdle; <i>sacro-sciatic ligaments</i> ; dorsal and ventral, or neural and visceral cavities; <i>clinical and obstetric notes</i>	39
--	----

CHAPTER IV

BONES AND ARTICULATIONS OF THE EXTREMITIES

Bones of the upper extremity; pronation and supination; bones of the lower extremity; patella; <i>Y-ligament</i> , <i>crucial ligaments</i> ; arches of the foot; comparison of extremities; articular nerves; <i>clinical and surgical notes</i> ; <i>special notes</i>	54
--	----

CHAPTER V

COMPLETION, REPAIR AND PHYSIOLOGY OF BONES

Completion of long bones; the skeleton at different ages; bones in infancy; green-stick fracture; rachitis; spina bifida; process of repair; physiology of bone tissues; <i>surgical and special notes</i>	75
--	----

CHAPTER VI

THE CONNECTIVE TISSUE FRAMEWORK AND SKELETAL MUSCLE SYSTEM

Fascia, deep and superficial; *inguinal ligament*; bursæ; structure of muscles; tendon and aponeurosis; origin and insertion; muscles of expression, of neck and thorax; abdominal muscles and linea alba; sheath of rectus, semilunar and transverse lines. Diaphragm; *surgical and clinical notes; special points*. 80

CHAPTER VII

MUSCLES OF THE EXTREMITIES

Structure and action of muscles of upper extremity; axillary space; pronators and supinators; vaginal synovial membranes; *annular ligaments*; palmar fascia; muscles of lower extremity; popliteal space; *annular ligaments*; physiology of muscle tissue; muscle tissue a source of heat and electricity; tetanus; cramp; fatigue; *clinical notes; special points*; classification by action. . . . 101

CHAPTER VIII

THE ORGANS OF DIGESTION

Alimentary tract or canal; glands of digestive apparatus; enzymes; saliva, *alkaline*; the stomach; gastric juice, *acid*; the intestine; intestinal fluids, *alkaline*; villi; ileo-colic valve; cecum and appendix; rectum and anal sphincters; peristalsis; liver and gall bladder; bile; the porta; *notes, clinical and surgical*. 130

CHAPTER IX

PHYSIOLOGY OF THE DIGESTIVE ORGANS. FOOD. ABSORPTION

Four classes of foods in dietary; air as food; food combination; reasons for cooking food; digestion, mechanical and chemical; mastication, insalivation; gastric digestion (*acid*), *chyme*; intestinal digestion *chyle*; peristalsis; absorption; *clinical notes* 153

CHAPTER X

THE BLOOD AND CIRCULATORY ORGANS

Blood-corpuscles or cells. Erythrocytes and leucocytes; ameboid movements, diapedesis; plasma (alkaline); normal saline solution; arteries, capillaries, veins; the heart; chambers and valves of heart; endocardium; systole and diastole; the pulse; pericardium; course of blood through the heart; innervation of the heart; *surgical and clinical notes; important notes*. 171

CHAPTER XI

THE CIRCULATION OF THE BLOOD

Pulmonary vessels; aorta and branches; arteries of the head, of the upper extremity; palmar arches; thoracic, abdominal and pelvic arteries; arteries of the lower extremity; veins, deep and superficial; jugular veins; azygos veins; superior vena cava; inferior vena cava; portal circulation; fetal circulation; collateral circulation; *clinical and surgical notes*. 187

CHAPTER XII

PHYSIOLOGY OF THE BLOOD

Important functions of the blood; coagulation; formation of fibrin; coagulation-time; phagocytosis; opsonins and opsonic index; antibodies; hypodermoclysis; transfusion; osmosis; blood pressure; hemorrhage and control of hemorrhages; *clinical notes; important notes*. 213

CHAPTER XIII

THE LYMPH SYSTEM

Lymph spaces, capillaries, and vessels; lymph, origin; lymph glands or nodes; edema, effusion; thoracic duct; right lymphatic duct; principal nodes; the lymph stream; hyperemia, metastasis; physiology of lymph system; *clinical notes*. 221

CHAPTER XIV

THE RESPIRATORY ORGANS AND RESPIRATION

The respiratory tract; the nose, nares and choanæ; the larynx; trachea, bronchi and bronchial tubes; ciliated epithelium; air cells; the lungs; the pleuræ; respiratory movements; physiology of respiratory organs; ventilation; respiration and heat production; modifications of breathing; *clinical notes*. 231

CHAPTER XV

ELIMINATION

Organs of elimination; the kidney; structure of the kidney; urinary bladder; urethral caruncle; physiology of the kidney; urine; excretion of urine; quantity and variations; importance of the process; nephritis; albuminuria; renal casts; malposition of kidney; floating kidney 244

CHAPTER XVI

ELIMINATION (Continued)

The skin; structure of the skin; layers; epidermis and derma, or cuticle and corium; papillæ; vascularity of skin; elasticity; sensibility; *panniculus adiposus*; glands of skin; appendages; hair; nails, structure of; physiology of skin; protective; excretory; organ of sense of touch; importance of perspiration; evaporation; diaphoresis 253

CHAPTER XVII

MAMMARY GLANDS. DUCTLESS GLANDS OR ENDOCRIN SYSTEM

Structure of mammary gland; milk; colostrum; mammary abscess; ductless glands and internal secretions or autocoid substances; hormones, chalones; the spleen, structure and blood supply; leukemia; the pancreas structure and blood supply; adrenals, adrenalin; thyroid body; cretinism; thymus body an infantile structure; pituitary body or hypophysis; chromaffin tissues. 260

CHAPTER XVIII

METABOLISM

Secretion and secreting organs; excretion and excreting organs; general metabolism; uses of food; values in metabolism; calorific value; diet charts; influences effecting metabolism; animal heat; heat production; heat dissipation; range of normal temperature; preservation of heat. 269

CHAPTER XIX

THE NERVE SYSTEM

Two divisions of the nerve system, cerebro-spinal and sympathetic; the neuron, cell body and nerve fiber; cerebro-spinal division; gray and white nerve tissues; nerve centers; spinal cord and membranes; structure of spinal nerves; *surgical and clinical notes* 277

CHAPTER XX

THE SPINAL NERVES

Anterior and posterior divisions; the cauda equina; cervical plexus, phrenic nerve; brachial plexus, radial, ulnar and median nerves; lumbar plexus, femoral nerve; sacral plexus, sciatic nerves 284

CHAPTER XXI

THE BRAIN AND CRANIAL NERVES

Structure of brain, cortex and fibers; fissures; ganglia; internal capsule; cerebellum; medulla oblongata; pons; crura; ventricles of brain; membranes of brain; cranial nerves; physiology of brain and cranial nerves; cerebral localization, *surgical and clinical notes* 299

CHAPTER XXII

THE SYMPATHETIC DIVISION OF THE NERVE SYSTEM

Vertebral ganglia; cardiac and splanchnic nerves; cardiac and celiac (solar) plexuses; semilunar ganglia; functions of sympathetic nerves; vasomotor and reflex, presiding over visceral action; functions of nerve system as a whole; *Important notes*; Summary. 316

CHAPTER XXIII

THE SPECIAL SENSES

General and special sensation; the sense of smell, olfactory region; the sense of touch, touch corpuscles; the sense of taste, taste buds; the sense of hearing, external ear and auditory canal; middle ear or tympanum and auditory tube; internal ear or labyrinth; acoustic nerves 325

CHAPTER XXIV

THE SENSE OF SIGHT. THE VOICE

The sense of sight; structure of eyeball; myopia; hyperopia; astigmatism; range of accommodation; eyelids, lacrimal gland; associated movements; the voice; vocal cords; organs of speech 335

CHAPTER XXV

THE PELVIC ORGANS

Organs of male pelvis; of female pelvis; the uterus; uterine or Fallopian tubes; the ovaries, ovulation; corpus luteum; menstruation; the menopause; the vagina and infra-vaginal portion of cervix uteri; the pudendum; the perineum; the testes and spermatic cord; peritoneum of pelvis; impregnation; decidual membranes; placenta; pregnancy; the lochia. 346

CHAPTER XXVI

A BRIEF STUDY OF IMPORTANT REGIONS

The head; the neck; thorax and thoracic viscera; abdomen, abdominal viscera and peritoneum; the ischio-rectal fossa; the axillary space; the ante-cubital space; Scarpa's triangle or the femoral trigone; Hunter's canal or the adductor canal; the popliteal space; the inguinal rings and inguinal canal; the femoral rings and femoral canal; hernia; the extremities compared; review notes; points for compression of larger arteries of the body. 360

CHAPTER XXVII

REFERENCE TABLES

The systemic arteries; names of systemic arteries and veins according to the B. N. A. 379
Glossary 389
Index 401

ANATOMY AND PHYSIOLOGY

INTRODUCTORY

Anatomy deals with the *structure* of the body in its different parts; physiology teaches the uses or *functions* of those parts.

PLAN OF STUDY

We shall study first the framework of the body—the bones which give support to all other structures, with the joints by which they are held together, either loosely or firmly; and the muscles by which they are moved and still further connected.

Afterward will be presented the organs or viscera (which are enclosed in the two general cavities formed by the bones and muscles) with their *nerve supply*, and the system of *vessels* by which the entire body receives its nutriment. We shall see that all these parts are wrapped in delicate **connective tissue**, and held in place by bands and sheaths of the same substance. The muscles are stretched upon the bones, the firm layers and partitions of **deep fascia** bind them in place, the wrapping of **superficial fascia** keeps them warm and flexible, and the **skin** or **integument** makes an elastic and sufficient covering for the whole.

The study of the **nerves** by which these structures receive their stimulus, and the action and interaction of the various parts, will follow.

The organs of the **special senses** receive attention, and the last section is devoted to a review of the several regions of the body which, it is hoped, will prove interesting and profitable.

ANATOMIC USE OF TERMS

The **anatomic position** is that with the face toward the observer and the palms turned forward, and the terms *anterior*, *posterior*, *right*, *left*, etc., are to be understood with this position

in mind. Thus, the *anterior surface* of the hand is always the *palm*; and, if we speak of any part as situated to the right we mean that it is nearer to the right side of the *body which we are studying* (which for convenience we will call the "subject"), but it has no relation whatever to the right side of the student. Of course the words *superior* and *inferior* are easily understood, but the use of the words *medial* and *lateral* (formerly internal and external) requires special mention. Imagine a line drawn through the middle of the head and trunk and striking the floor between the feet, thus dividing the body into right and left halves. This is called the *median line*. Any part or surface of one-half of the body is said to be *medial* to another part if it is nearer the median line while in the anatomic position, or *lateral* to another part if it is farther from the median line.

All of these terms once applied to a part of the body belong to it always. For example, the little finger is always *medial* to the others and the great toe is likewise medial, because these relations are established once for all while the subject is in the anatomic position. Likewise, the palm is the *anterior surface* of the hand even if it be temporarily turned backward.

The words *exterior* and *interior* are applied to the parts of the body which are on the surface or within, respectively.

Proximal means nearer to the head; *distal*, farther from the head. Thus we may speak of the proximal end of the finger, or the distal end of a toe, or the proximal end and distal end of an arm or a leg.

Certain words have been so long applied in a special sense in connection with anatomic relations and physiologic processes that usage has made them *technical*, that is, they have come to possess a professional meaning.

Hilum (literally a *little thing*) is applied to a place *on the surface* of an organ; a depression usually, where the vessels and nerves enter and leave it. Thus, we see the *hilum* of the *kidney*, of the *lung*, of the *spleen*. The hilum is always found on the *medial* or most protected surface of an organ. (In the case of the liver it is on the inferior surface and is called the *porta* or *gateway*.)

Sinus (literally a *hollow* or indentation) is applied in anatomy to a hollow or enlarged space *within an organ*, containing either air or fluid. *Air sinuses* are hollow spaces (almost enclosed), con-

nected with the nasal passages; these are cavities in the cranial and facial *bones*. *Lymph sinuses* are the spaces within lymph glands. They contain *lymph* (in some glands—*blood*). *Sinuses containing fluid* are large channels in the outer membrane of the brain—containing venous blood. Other blood *sinuses* are found in the heart. The *sinus of the kidney* is the hollow which is reached through the hilum which leads into it; this contains *urine*. In surgery a *sinus* is a narrow abnormal channel through the tissues (usually lined by or connected with an ulcerating surface).

Center and *periphery* are so used (technically) in connection with the nervous system. The *center* is the cell or cells to which a nerve must belong *and be connected with* in order to be active. It need not necessarily be in the middle of a part—some of the most important centers are on the surface of the brain. The *periphery* is the location of the extremity of the nerve. Literally it signifies the *outer boundary* or the outside of a thing, but when used in connection with a nerve it refers to the *end farthest from the cell or center*, whether within or without the body.

Centrifugal nerves transmit from center to periphery (they are *efferent*).

Centripetal nerves transmit from periphery to center (they are *afferent*).

Efferent vessels carry blood *from* organs; *afferent* vessels carry blood *to* organs.

Stimulus in physiology signifies any agency which causes a tissue or an organ to perform its function. A *natural stimulus* is a normal exciting cause and leads to normal action or function.

An *element* is, in chemistry, a substance which cannot be divided into other substances. The most important elements in the human body are comparatively few. They will be referred to, sometimes by name, sometimes by *symbol*. By agreement, certain letters stand for certain elements (usually the initials of their Latin names).

O is the symbol for Oxygen

H is the symbol for Hydrogen

N is the symbol for Nitrogen

C is the symbol for Carbon

S is the symbol for Sulphur

Fe is the symbol for Iron (Ferrum)

P is the symbol for Phosphorus

K is the symbol for Potassium (Kalium)

Na is the symbol for Sodium (Natrium)

(Combinations frequently used are CO_2 for *carbon dioxide* or "*carbonic acid gas*," H_2O for *water*.)

Food principles are simple or compound substances, composed of one or several elements. They are broadly classed as, 1. *containing nitrogen, nitrogenous*, 2. *without nitrogen, non-nitrogenous*, and 3. *containing only mineral substances*.

TISSUES AND MEMBRANES OF THE BODY

The simplest form of living matter is *protoplasm*. A *living cell* may be nothing more than a definite quantity of protoplasm (called *cytoplasm* or *bioplasm*) or it may be more complex, having a *nucleus*, when it is said to be nucleated, and it may have a *nucleolus* within the nucleus. A nucleated cell is capable of forming new cells by the division of its substance, the division always *beginning in the nucleus*.

Sometimes the cell is enveloped by a thin membrane called the *cell wall*.



FIG. 1.—CONNECTIVE-TISSUE BUNDLES OF VARIOUS THICKNESSES OF THE INTERMUSCULAR CONNECTIVE TISSUE OF MAN. $\times 240$.—(Lewis and Stöhr.)

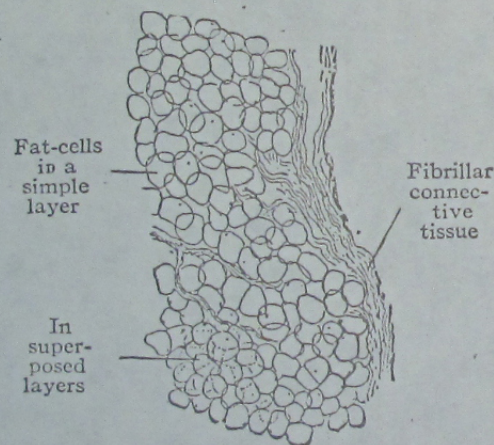


FIG. 2.—ADIPOSE TISSUE.—(Lewis and Stöhr.)

Tissue.—Any collection of cells held together by intercellular substance is a *tissue*. The various tissues of the body are composed of cells (and intercellular substance) which are developed in special ways; for example:

Muscle tissue is composed largely of cells which are highly developed in the power to contract. *Contractile tissues* (list, p. 83).

Nerve tissue, of cells which are particularly sensitive to special kinds of stimulus.

Connective tissue is the fibrous soft framework of the entire body—the connecting structure by means of which all of its parts are held together. (Fig. 1.)

Under this heading are included the following varieties:

Fibrous tissue, a form of connective tissue containing slender white fibers, closely packed together.

Areolar tissue, containing the same kind of fiber cells loosely woven into a network (often called cellular tissue).

Adipose tissue, a variety of areolar tissue with cells containing fat. (Fig. 2.)

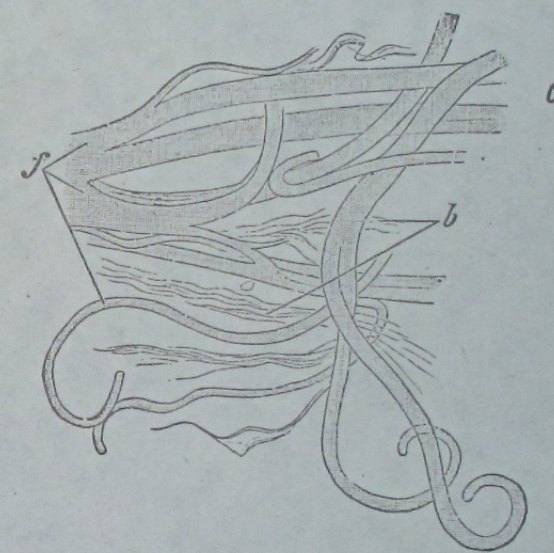


FIG. 3.—ELASTIC FIBERS. $\times 560$. Very thick elastic fibers *f*, from ligamentum nuchæ of ox; *b*, connective-tissue bundles.—(Lewis and Stöhr.)

Elastic tissue, a form of connective tissue containing many elastic fibers, pale yellow in color. (Fig. 3.)

Osseous tissue, composed largely of cells having the power to utilize mineral substances of the blood in the formation of bone. (The *intercellular* substance is filled with mineral matter.) (Figs. 7 and 8.)

Cartilage, a form of connective tissue with firm white elastic substance (*intercellular* substance) between its cells. Many cartilages are covered with a thin membrane called *perichondrium*, similar to the periosteum of bones (see page 13).



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